



## KNOWLEDGE AND EMPLOYABILITY SCIENCE 8–9

**Policy:** Knowledge and Employability courses provide students who meet the criteria with opportunities to experience success and become well-prepared for employment, further studies, citizenship and lifelong learning (*Knowledge and Employability Courses Policy 1.4.2*).

### VISION

Through Knowledge and Employability courses, students become active, responsible citizens, achieve their educational and career goals, improve the quality of life for themselves and their families, and positively impact their communities.

### PHILOSOPHY AND RATIONALE

The development of a distinctive sequence of courses such as Knowledge and Employability is based on input about the needs of learners gathered from consultations with education stakeholders throughout the province.

To meet the educational needs of students, Knowledge and Employability courses are designed for the student who learns best:

- when meaningful connections are made between schooling and personal experiences.
- when the focus is on the development and application of reading, writing and mathematical literacy,<sup>1</sup> and essential employability skills through experiential learning activities
- when meaningful connections are made between schooling and personal experiences.

Knowledge and Employability courses assist students to make the transition from school to the workplace and community, prepare for responsible citizenship, and be recognized, respected and valued by employers and further education providers. The skills, abilities and work effort that Knowledge and Employability courses promote include:

- academic and occupational skills of a standard determined by the workplace to be necessary for success
- practical applications through on- and off-campus experiences and/or community partnerships
- career development skills to explore careers, develop a career-focused portfolio and assess career skills
- interpersonal skills to ensure respect, support and cooperation with others.

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mathematical literacy: Selecting and applying appropriate mathematical operations, problem-solving strategies, tools and technology, and communicating using mathematical vocabulary in home, workplace and community experiences.

Knowledge and Employability  
Education, Alberta, Canada

Science 8–9 /1  
(2005 Draft)



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- when the focus is on the development and application of reading, writing and mathematical literacy,<sup>1</sup> and essential employability skills
- through experiential learning activities

- when meaningful connections are made between schooling and personal experiences.

Knowledge and Employability courses assist students to make the transition from school to the workplace and community, prepare for responsible citizenship, and be recognized, respected and valued by employers and further education providers. The skills, abilities and work effort that Knowledge and Employability courses promote include:

- academic and occupational skills of a standard determined by the workplace to be necessary for success
- practical applications through on- and off-campus experiences and/or community partnerships
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- interpersonal skills to ensure respect, support and cooperation with others.

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1. *Mathematical literacy: Selecting and applying appropriate mathematical operations, problem-solving strategies, tools and technology, and communicating using mathematical vocabulary in home, workplace and community experiences.*

### **Aboriginal Perspectives and Experiences**

For historical, constitutional and social reasons, an understanding of First Nations, Métis and Inuit (FNMI) experiences and perspectives, and recognition that First Nations, Métis and Inuit students have particular needs and requirements is necessary to enable all students to be respectful and responsible citizens.

Knowledge and Employability courses serve to facilitate positive experiences that will help Aboriginal students better see themselves in the curriculum and assist non-Aboriginal students to develop a better understanding of Alberta's First Nations, Métis and Inuit peoples.

### **GOALS OF KNOWLEDGE AND EMPLOYABILITY COURSES**

Knowledge and Employability courses provide students with practical and applied opportunities to develop competencies necessary to meet or exceed the following goals:

- earn a senior high school credential
- enter the workplace upon leaving school with employability and occupational skills that meet industry standards
- make successful transitions to other courses or to further education and training
- become responsible and contributing members of society.

### **CROSS-CURRICULAR COMMUNITY AND WORKPLACE CONNECTIONS**

Programs of study and resources for Knowledge and Employability courses are distinctive, in part, because they promote cross-curricular, community and workplace connections.

#### **Cross-curricular Connections**

Knowledge and Employability courses promote the integration of subjects to emphasize their interrelationships and connections to other school subjects. The philosophy of Knowledge and Employability courses is that students learn best when they can clearly recognize connections, applications and relevance to a variety of everyday experiences. Organizing for

instruction may include thematic units, subject integration within units and/or projects in other subjects.

#### **Community and Workplace Connections**

Knowledge and Employability courses provide students with practical and applied opportunities to develop basic reading, writing and mathematical literacy. Community and workplace connections ensure learning within applied contexts and connect the school with environments beyond school, and may include tours to local business and industry, mentorships, job shadowing and work experience.

Knowledge and Employability courses promote the development of career portfolios. Career portfolios help students connect their school experience to the world beyond school. Each portfolio will include exemplars of the student's on- and off-campus experiences and can be used when the student is seeking employment or other post-secondary opportunities. Items appropriate for inclusion in career portfolios are: resumes, samples of written work, awards and/or their representations, teacher and self-evaluation checklists, workplace assessment tools and employer letters of recommendation.

#### **SAFETY**

Safety is emphasized and incorporated throughout Knowledge and Employability courses. Courses include basic safety rules and guidelines, and the safe use of tools, equipment and materials in school, home, community and workplace settings.

#### **TECHNOLOGY**

Because technology is best learned within an applied context, Information and Communication Technology (ICT), and the use of computers and other technologies are included in Knowledge and Employability courses to help students make the transition to the world beyond school.



## ESSENTIAL UNIVERSAL SKILLS AND STRATEGIES

Knowledge and Employability courses emphasize universal skills and strategies that are essential to all students, including the following.

- Interpersonal skills to promote teamwork and respect for, support of and cooperation with others.
- Critical thinking to promote the analysis and appropriate applications of information.
- Creative thinking to promote identification of unique connections among ideas and insightful approaches to questions and issues.
- Decision making to promote making timely and appropriate decisions.
- Problem solving to promote the ability to identify or pose problems, and apply learning to consider the causes, dimensions of and solutions to problems.
- Metacognition<sup>2</sup> is thinking about thinking and enables students to become more aware of their own thinking and learning processes, and gain greater control of these processes.

## RELATIONSHIP TO OTHER COURSES

To enable students, as appropriate, to progress to other Knowledge and Employability course(s) and/or other secondary courses, each Knowledge and Employability course is consistent with the rationale, philosophy, program foundations and organization of other secondary courses.

## ENROLLMENT IN KNOWLEDGE AND EMPLOYABILITY COURSES

Students may take one or more courses in the sequence at any time during grades 8 through 12. Students may be enrolled in all courses, or a combination of Knowledge and Employability and other courses.

For information about identifying students for enrollment in one or more courses, see *Knowledge and Employability Courses Policy* and the *Information Manual for Knowledge and Employability Courses*.

## RATIONALE AND PHILOSOPHY OF KNOWLEDGE AND EMPLOYABILITY SCIENCE

Knowledge and Employability Science focuses on developing and applying essential science skills, knowledge and attitudes needed for everyday living at home, in the workplace and in the community. Science competencies are developed through investigating science-related problems, questions and issues, and providing everyday applications to help students understand and appreciate the role of science in our society.

Knowledge and Employability Science courses emphasize career/life skills, teamwork, communication skills and thinking processes. Each grade level is developed within a scientific inquiry framework emphasizing problem-solving and decision-making skills appropriate for students' abilities and everyday applications.

Diverse learning experiences within the science courses provide students with opportunities to explore, analyze and appreciate the interrelationships among science, technology, society and the environment, and develop understandings that will affect their lives at home, in the workplace and in the community.

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2. *Metacognition: Learning-to-learn strategies; awareness of processes and strategies one uses when learning.*

## SCIENCE FOUNDATIONS

Knowledge and Employability Science courses promote development of the four foundations of science.

### **Foundation 1: Science, Technology and Society (STS)**

Students will explore their everyday home, workplace and community environments, gather information, develop ideas, and use technology and other tools to make decisions about their personal lives. Students will recognize the influence of science on decision making by individuals, communities and society.

### **Foundation 2: Knowledge**

Students will investigate theories, models, concepts, processes and principles in life, physical, Earth and space science with an emphasis on application to everyday living.

### **Foundation 3: Skills**

Students will develop scientific communicating and teamwork, initiating and planning, performing and recording, and analyzing and interpreting skills to answer questions, solve problems and make decisions in their everyday lives.

### **Foundation 4: Attitudes**

Knowledge and Employability Science courses emphasize the development of positive attitudes and behaviours related to collaboration, mutual respect, safety and stewardship in everyday living.

## GOALS

The principal goal of Knowledge and Employability Science is to assist students to become contributing members of society and independent and lifelong learners by developing the following science competencies:

- communication and teamwork skills for collaborative group work
- attitudes that enable use of knowledge and skills in a responsible manner

- selection and application of appropriate science skills, tools and strategies to understand and interpret the world
- exploration of interests and ideas, using appropriate problem-solving and decision-making strategies
- application of science understandings, skills and attitudes to everyday life/work situations.

## UNITS OF STUDY

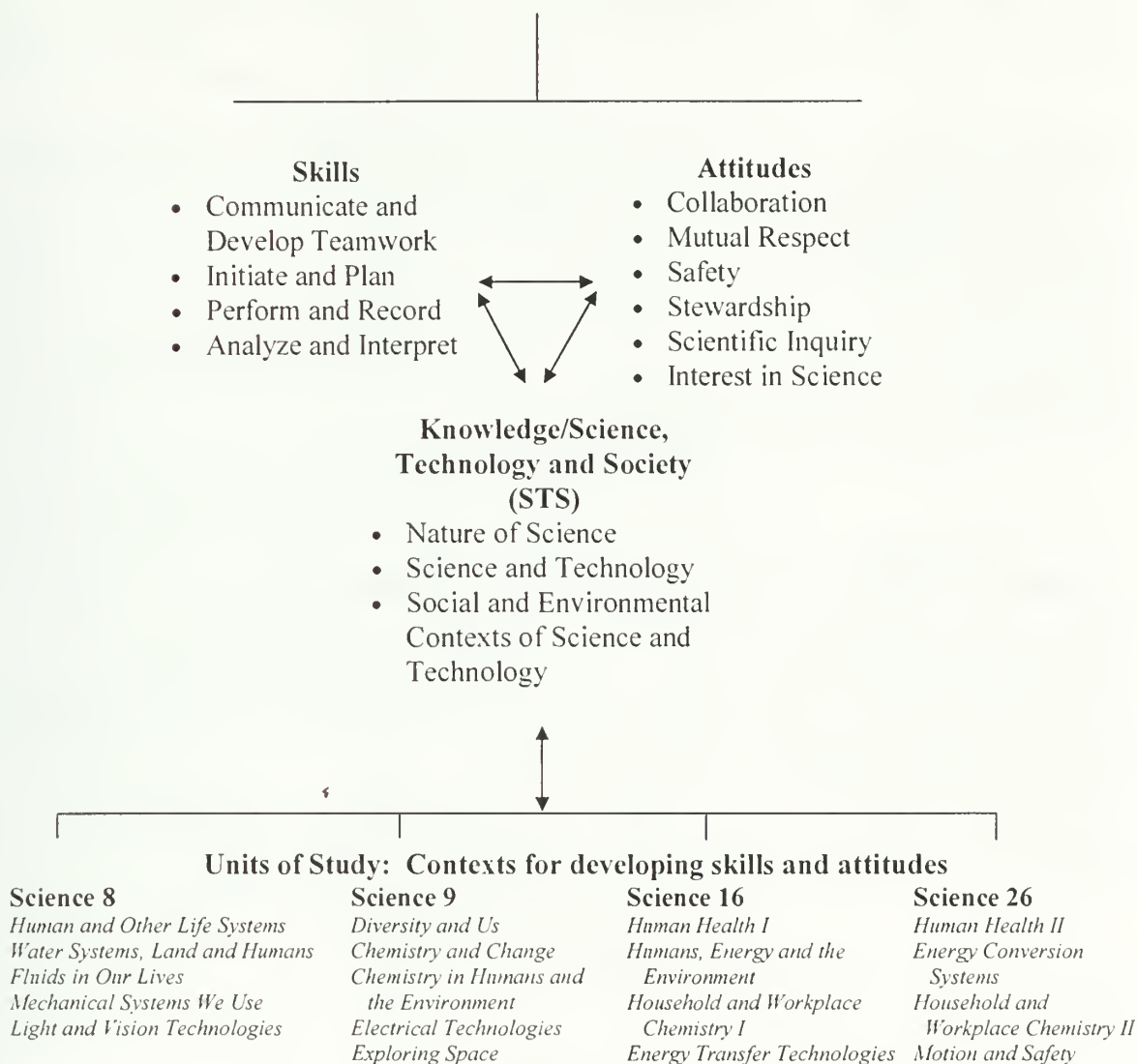
When the components of science are organized into appropriate contexts, students can solve problems and make decisions about science in relation to their everyday experiences.

The **Units of Study** provide the contexts within which skills, attitudes, knowledge and science, technology and society (STS) outcomes are developed as appropriate for students' abilities and everyday living at home, in the workplace and in the community.

Each unit of study has guiding questions to provide direction for inquiry. Specific outcomes include key concepts that are bolded to highlight their significance.

## GRAPHIC OF KNOWLEDGE AND EMPLOYABILITY SCIENCE

Knowledge and Employability Science provides basic science literacy. The course promotes awareness, understanding, and the development and application of science skills, knowledge and attitudes for successful living at home, at the workplace and in the community.



## SCIENCE 8

**SCIENCE OUTCOMES:** Students will develop and apply science skills, attitudes and knowledge to investigate everyday, science-related problems, questions and issues; perform experiments; carry out investigations; include Aboriginal experiences/perspectives as appropriate; and relate scientific process skills to home, workplace and community experiences. Students will develop an awareness of how science skills, attitudes and knowledge are used in other subjects and everyday life.

**SKILLS OUTCOMES:** Students will apply science skills, processes and technology as appropriate to a variety of everyday and science-related questions, problems and issues.

### COMMUNICATE AND DEVELOP TEAMWORK

Students will use appropriate vocabulary to communicate scientifically, and appropriate communication and team building skills to work successfully in a group at school, at home, in the workplace and in the community.

In relation to the Units of Study, *students will:*

- a. communicate questions, ideas, intentions, plans and results, using a variety of strategies such as:
  - speaking and/or writing skills
  - lists, notes
  - data tables, graphs, drawings
  - computer and/or other presentations
- b. communicate a position on an issue or problem based on personal/group findings
- c. listen to and act on the ideas of others
- d. collaborate with others to plan and achieve science goals.

### INITIATE AND PLAN

Students will initiate the process of, and develop plans for, resolving problems, investigating issues and/or completing experiments, using technology as appropriate. Students will apply science-related initiating and planning skills to everyday situations at home, in the workplace and in the community.

In relation to the Units of Study, *students will:*

- a. identify everyday problems, questions and issues
- b. identify science-related problems, questions and issues
- c. plan an investigation of everyday and science-related problems, questions and issues
- d. identify prior knowledge and determine information gaps
- e. formulate and list questions to clarify, focus and plan
- f. state a prediction to guide investigation
- g. identify appropriate methods and tools for collecting data and information.



## PERFORM AND RECORD

Students will investigate everyday and science-related problems, questions and issues, perform experiments and record information, using technology as appropriate. Students will apply science-related performing and recording skills to everyday situations at home, in the workplace and in the community.

In relation to the Units of Study, *students will:*

- a. perform experiments and/or conduct investigations
- b. use reading, listening, recalling and other communication skills to locate information relevant to a problem, issue or question
- c. select and identify relevant information/data from various print and electronic sources
- d. identify the variables to be examined in an investigation or experiment
- e. recognize that information and sources may be inaccurate, incomplete and/or biased
- f. demonstrate responsibility for following appropriate security and safety measures when using technology, the Internet and other information sources (e.g., respect the products and privacy of others)
- g. use tools, technology and apparatus safely for collecting and organizing data
- h. compile and display data/information by hand and/or using computers/other technology in a variety of formats, such as:
  - diagrams, flow charts, tables
  - bar or line graphs
- i. use and/or construct a classification key to organize information
- j. estimate and determine measurements
- k. design, construct and test prototypes as appropriate.

## ANALYZE AND INTERPRET

Students will analyze and interpret results of everyday and science-related investigations/experiments, and assess personal and group performance, using technology as appropriate. Students will apply science-related analyzing and interpreting skills to everyday home, workplace and community situations.

In relation to the Units of Study, *students will:*

- a. identify patterns and relationships in information and data
- b. identify discrepancies in data
- c. evaluate the design of a constructed device or system
- d. state a reasonable response or conclusion to the problem/question/issue
- e. identify strengths and weaknesses of methods used to collect and display data
- f. assess and analyze personal performance on individual and group investigations/experiments to improve teamwork skills.

**ATTITUDE OUTCOMES:** Students will continue to be encouraged to develop and display collaboration, mutual respect, safety, stewardship, scientific inquiry and interest in science. Students will be encouraged to apply appropriate scientific attitudes to home, workplace and community situations.

	<i>Students will be encouraged to:</i>
<b>COLLABORATION</b>	a. work collaboratively in carrying out investigations and in generating ideas.
<b>MUTUAL RESPECT</b>	b. listen to and accept the viewpoints of others c. recognize that different cultures, including Aboriginal cultures, may have unique scientific perspectives.
<b>SAFETY</b>	d. accept the need for rules and regulations e. demonstrate concern for safety in planning, carrying out and reviewing activities.
<b>STEWARDSHIP</b>	f. demonstrate sensitivity in pursuing a balance between the needs of humans and the requirements for a sustainable environment g. recognize that the traditional Aboriginal lifestyle supports a unique relationship with the environment.
<b>SCIENTIFIC INQUIRY</b>	h. value and use scientific methods to carefully gather evidence in investigating problems and issues.
<b>INTEREST IN SCIENCE</b>	i. demonstrate interest in science-related questions and issues.

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## SCIENCE 8

### KNOWLEDGE/SCIENCE, TECHNOLOGY AND SOCIETY (STS) OUTCOMES

**UNITS OF STUDY:** Units of study in Knowledge and Employability Science provide the context for the development of science skills and attitudes. The units provide opportunities for students to construct knowledge and understanding in science, and apply these understandings to interpret, integrate and extend their knowledge in everyday home, workplace and community settings.

#### 8.1 HUMAN AND OTHER LIFE SYSTEMS (Cells and Systems)<sup>1</sup>

##### Guiding Questions

*How do the circulatory, digestive and respiratory systems of the human body work together, and how can we keep them healthy?*

*How are the human body systems similar to and different from the systems of other organisms?*

*Students will:*

- recognize that the **structures** and **functions** of **cells, tissues, organs** and **systems** are distinctive yet dependent
- recognize that cells are the basic units of life
- distinguish the main differences between animal and plant cells (cell wall, chloroplasts, ability to photosynthesize)
- recognize that the **circulatory, digestive** and **respiratory** systems have distinctive functions and are interdependent
- investigate changes in body functions and behaviour resulting from changing conditions including migration, hibernation, camouflage and the fight or flight response
- recognize factors that relate to the **healthy functioning** of human circulatory, digestive and respiratory systems
- identify community and other events, organizations or businesses that support awareness and understanding of human health.

#### 8.2 WATER SYSTEMS, LAND AND HUMANS (Fresh and Saltwater Systems)

##### Guiding Questions

*How do fresh and saltwater systems affect us, other organisms and our land?*

*What factors affect water and land in our community, e.g., agriculture, oil industry, forestry, and recreational vehicles and activities?*

*How did traditional Aboriginal societies use water systems?*

*Students will:*

- distinguish an **aquatic ecosystem** from other ecosystems
- compare adaptations of organisms to fresh and salt water ecosystems
- investigate erosion, deposition and movement of/in **ocean basins** and continental drainage systems
- recognize that fresh and salt water contain varying amounts of dissolved materials, particulates and biological components
- relate **climate** and **weather** to **glaciers, ice caps** and **water supply**
- recognize that fresh water can be generated from salt water using evaporation, distillation and reverse osmosis
- investigate the **human impact** on the supply, quality and distribution of fresh and salt water organisms
- identify community and other events, organizations or businesses that relate to use and distribution of water systems.

#### 8.3 FLUIDS IN OUR LIVES (Mix and Flow of Matter)

##### Guiding Questions

*What are common examples of the fluids used everyday at home and at the workplace (e.g., water, cleaning products and gasoline/oil in vehicles)?*

*Students will:*

- identify samples of fluids in living things and natural environments
- identify examples of **fluids** in everyday situations:
  - paints
  - air in tires
  - cooking and cleaning
  - gasoline and oil in vehicles and home heating

1. Brackets represent title of related units of study in Science 8.

*How do we use fluids safely in community and workplace environments?*

*How can we dispose of harmful fluids safely?*

#### 8.4 MECHANICAL SYSTEMS WE USE (Mechanical Systems)

##### Guiding Questions

*What mechanical systems do we use every day and how do they impact our daily lives (e.g., bicycles, skate boards, trucks, cars, ramps, can openers, CD/DVD players, elevators and door knobs)?*

#### 8.5 LIGHT AND VISION TECHNOLOGIES (Light and Optical Systems)

##### Guiding Questions

*What are vision technologies?*

*How do vision technologies influence our everyday lives?*

*What changes have taken place in lights over the last two generations (e.g., halogen lamps) and how have these affected use, costs, etc.?)*

- c. recognize **Workplace Hazardous Materials Information Systems (WHMIS)** symbols and **Hazardous Household Product Symbols (HHPS)** to use fluids safely
- d. recognize that temperature and the **concentration** of **solute** and **solvent** affect flow rates, viscosity and buoyancy of fluids
- e. recognize that pressure is a force per unit area and identify applications of fluid pressure in everyday situations such as air in tires, fuel in a pipeline, and hydraulic brakes and lifts
- f. investigate how fluids are transported, including the technologies involved and necessary safety precautions
- g. identify community and other events, organizations or businesses that support awareness of safe use and disposal of fluids and other related issues.

*Students will:*

- a. identify and classify a variety of everyday **simple machines** using load, force and fulcrum
- b. identify the use of simple machines and mechanical systems at home, at the workplace and in the community including those of traditional Aboriginal societies such as travois and tipis
- c. recognize the relationship between the **design** and **function** of simple machines and mechanical systems
- d. recognize that simple machines and mechanical systems provide speed and/or force advantage when doing work
- e. recognize that work is measured in joules (J)
- f. recognize that **mechanical systems** are a combination or modification of one or more simple machines
- g. identify the sources of energy for familiar mechanical devices (e.g., human, batteries, electricity, gasoline)
- h. investigate a common mechanical device (such as a bicycle, vacuum cleaner and tire or water pump)
- i. identify how community and other events, organizations or businesses use mechanical systems and promote awareness of safety and other related issues.

*Students will:*

- a. identify various natural and artificial **sources of light** at home, at the workplace and in the community
- b. investigate the effects of light and lenses on **images** using **microscopes, telescopes** and other **optical devices**
- c. investigate the effects of various materials on light and how light is **reflected, absorbed, refracted** and **transmitted**
- d. recognize that the human eye is similar to a camera
- e. recognize that human eyes are similar to, yet different from, the eyes of invertebrates and other vertebrates
- f. investigate how light and vision technologies have influenced everyday living (e.g., eye glasses, contact lenses, flashlights, glow sticks and household and workplace lights)
- g. investigate factors that influence the health of the human eye
- h. identify how community and other events, organizations or businesses use light and vision technologies.



SCIENCE 9

**SCIENCE OUTCOMES:** Students will develop and apply science skills, attitudes and knowledge to investigate everyday, science-related problems, questions and issues; perform experiments; carry out investigations; include Aboriginal experiences/perspectives as appropriate; and apply scientific process skills to home, workplace and community experiences. Students will develop an awareness of how science skills, attitudes and knowledge are used in other subjects and everyday life.

**SKILLS OUTCOMES:** Students will apply science skills, processes and technology as appropriate to a variety of everyday and science-related questions, problems and issues.

COMMUNICATE AND DEVELOP TEAMWORK

Students will use appropriate vocabulary to communicate science information; and appropriate communication and team building skills to work successfully in a group at school, at home, in the workplace and in the community.

- In relation to the Units of Study, *students will:*
- a. work cooperatively with team members to develop and carry out a plan including:
    - listen to the input of others
    - restate the plan objectives and goals
    - remain on task
    - encourage others to remain on task
  - b. recommend appropriate methods for summarizing and interpreting findings
  - c. support a personal/group position, using appropriate communication and other strategies/tools/methods
  - d. collaborate with others to achieve science goals
  - e. identify strategies/behaviours that enhance group activities
  - f. evaluate personal performance in group activities
  - g. investigate and apply a variety of appropriate strategies/skills to troubleshoot problems.

INITIATE AND PLAN

Students will initiate the process of, and develop plans for, resolving problems, investigating issues and/or completing experiments, using technology as appropriate. Students will apply science-related initiating and planning skills to everyday situations at home, in the workplace and in the community.

- In relation to the Units of Study, *students will:*
- a. identify everyday and science-related problems, questions and issues
  - b. identify prior knowledge and determine information gaps
  - c. list questions to investigate arising from everyday and science-related problems, questions and issues to guide investigation
  - d. select appropriate methods and tools for collecting data and information
  - e. develop and clearly articulate a plan of action to use technology and other tools or strategies to investigate problems, questions and issues
  - f. identify all the variables related to an investigation or experiment and select variables for a specific inquiry
  - g. propose alternative solutions to a problem, question or issue, including those used by traditional Aboriginal cultures.

## PERFORM AND RECORD

Students will investigate everyday and science-related problems, questions and issues; and perform experiments and record information, using technology as appropriate.

Students will apply science-related performing and recording skills to everyday situations at home, in the workplace and in the community.

In relation to the Units of Study, *students will:*

- a. carry out investigations of everyday and science-related problems, questions and issues, using technology and other tools
- b. perform experiments using tools, technology and apparatus safely, effectively and accurately
- c. recognize that information and sources may be inaccurate, incomplete and/or biased
- d. safely use tools, technology and apparatus to collect and organize data
- e. demonstrate responsibility for following appropriate security and safety measures when using technology, the Internet and other information sources (e.g., respect the products and privacy of others)
- f. record, organize and display data/information by hand and/or computer in a variety of formats such as:
  - diagrams, flow charts, tables
  - bar, line or other graphs
  - classification keys
- g. create and label diagrams/drawings, using technology as appropriate
- h. estimate and determine measurements.

## ANALYZE AND INTERPRET

Students will analyze and interpret results of everyday and science-related investigations/experiments, and assess personal and group performance, using technology as appropriate.

Students will apply science-related analyzing and interpreting skills to everyday home, workplace and community situations.

In relation to the Units of Study, *students will:*

- a. identify patterns and trends in information and data gathered
- b. identify and suggest explanations for discrepancies in data
- c. evaluate designs and prototypes in terms of function, safety, efficiency, use of materials, impact on the environment
- d. demonstrate/communicate how evidence gathered supports or refutes an initial problem/issue/idea/hypothesis
- e. apply given criteria for evaluating evidence, sources of information and different methods of collecting and displaying data
- f. identify new questions and problems that arise from what has been learned
- g. state conclusions and inferences based on results/outcomes
- h. identify potential applications of findings
- i. assess and analyze personal and group performance.

**ATTITUDE OUTCOMES:** Students will continue to be encouraged to develop and display collaboration, mutual respect, safety, stewardship, scientific inquiry and interest in science. Students will be encouraged to apply appropriate scientific attitudes to home, workplace and community situations.

	<i>Students will be encouraged to:</i>
<b>COLLABORATION</b>	a. work collaboratively in carrying out investigations and in generating ideas.
<b>MUTUAL RESPECT</b>	b. listen to and accept the viewpoints of others c. recognize that different cultures, including Aboriginal cultures, may have unique scientific perspectives.
<b>SAFETY</b>	d. accept the need for rules and regulations e. demonstrate concern for safety in planning, carrying out and reviewing activities.
<b>STEWARDSHIP</b>	f. demonstrate sensitivity in pursuing a balance between the needs of humans and the requirements for a sustainable environment g. recognize that the traditional Aboriginal lifestyle supports a unique relationship with the environment.
<b>SCIENTIFIC INQUIRY</b>	h. value and use scientific methods to carefully gather evidence in investigating problems and issues.
<b>INTEREST IN SCIENCE</b>	i. demonstrate interest in science-related questions and issues.

## SCIENCE 9

### KNOWLEDGE/SCIENCE, TECHNOLOGY AND SOCIETY (STS) OUTCOMES

**UNITS OF STUDY:** Units of study in Knowledge and Employability Science provide the context for the development of science skills and attitudes. The units provide opportunities for students to construct knowledge and understanding in science, and apply these understandings to interpret, integrate and extend their knowledge in everyday home, workplace and community settings.

#### 9.1 DIVERSITY AND US (Biological Diversity)<sup>1</sup>

##### Guiding Questions

*How are humans similar to and different from other organisms?*

*What are the main biological similarities and differences between humans and other organisms?*

*What factors affect our development and growth?*

*What businesses and/or industries in our community impact diversity, e.g., farms, greenhouses, and dog or racehorse breeders?*

*Students will:*

- investigate **biological diversity** to compare humans to other organisms and the variety within and among species
- investigate **community, population, habitat and niche** and relate to diversity within/among species
- recognize that **inherited traits** and transmission of chromosomes influence diversity and survival within and among species, and that inherited traits result from chromosomes, genes and DNA
- recognize that species are dependent on others and their environment for survival
- recognize that asexual reproduction does not involve mixing of genetic material and occurs when cells divide to promote growth and healing in humans and other species
- investigate the **human impact** on diversity such as in agriculture and horticulture
- investigate community and other events, organizations or businesses that promote awareness of and/or use the diversity among humans and/or animals and plants.

#### 9.2 CHEMISTRY AND CHANGE (Matter and Chemical Change)

##### Guiding Questions

*What safety standards are required when handling common household and workplace chemicals?*

*How do chemical changes affect our lives, e.g., the use of salt and sand on winter roads, rusting of nails, bridges, vehicles?*

*Students will:*

- identify and compare **Workplace Hazardous Materials Information System (WHMIS)** symbols and **Household Hazardous Products Symbols (HHPS)** and relate to **safety** in classroom, home and workplace settings (e.g., recognize that mixing chemicals at home and the workplace may result in safety hazards such as harmful fumes or high temperatures)
- recognize that all matter is made of **chemicals** and chemicals are made of atoms and molecules
- recognize the periodic table and that it is used to display and organize elements according to their properties (e.g., number of neutrons, protons, electrons and atomic mass)
- recognize the main differences between physical and chemical change, including the creation of odour, new products and temperature change
- apply the particle model of matter to explain the states of matter
- write word equations for common chemical reactions resulting in water, table salt, rust, oxygen and carbon dioxide
- investigate pH values, **acids and bases**, and identify how acids and bases are used at home and in the workplace (e.g., to clean workplace surfaces)
- investigate community and other events, organizations or businesses that relate to chemistry and chemical change.

1. Brackets represent title of related units of study in Science 9.



### 9.3 CHEMISTRY IN HUMANS AND THE ENVIRONMENT (Environmental Chemistry)

#### Guiding Questions

*What chemicals are important to our lives and how do we access them (e.g., vitamins, protein, carbohydrates and fat)?*

*How do people affect air and water quality in your area?*

### 9.4 ELECTRICAL TECHNOLOGIES (Electrical Principles and Technologies)

#### Guiding Questions

*How do we use electricity at home, at the workplace and in the community?*

*How do we measure energy use?*

*How can we use technology and other methods to increase electrical efficiency (e.g., renewable energy sources such as wind or radiation)?*

### 9.5 EXPLORING SPACE (Space Exploration)

#### Guiding Questions

*What do we use to explore space?*

*How does/may space exploration affect us in our daily lives?*

*How do other objects in space affect us, e.g., radiation from the sun, the moon's effect on tides, and solar flares influencing radio reception?*

*Students will:*

- investigate sources of information to identify types of foods and quantities needed for healthy living including *Canada's Food Guide to Healthy Eating*
- recognize that eating a **balance of foods** containing proteins, fats, carbohydrates, vitamins and minerals contributes to one's health and compare the diet of traditional Aboriginal society to contemporary North American society in relation to the maintenance of healthy lifestyles
- recognize that humans affect air and **water quality** through the use of chemicals at home and in the workplace and that humans produce some toxins
- recognize that laws exist to support clean air and water supplies
- investigate community and other events, organizations or businesses that promote healthy eating habits, water and air quality and the 3R's (e.g., composting, community collection programs or centres, garage sales).

*Students will:*

- identify a variety of **renewable** and **non-renewable** energy sources (thermal, electrical, solar, fossil fuels, wind, nuclear, hydro) including energy sources used by traditional Aboriginal societies
- identify safety factors needed when using electricity
- create and explain simple **series** and **parallel** electrical circuits to understand circuits at home and the workplace
- recognize that magnetism and electricity are related to each other
- recognize that energy is generated, stored, transmitted and transformed
- recognize the relationship among electric **charge, current** and **circuits**; and volts, amps and watts to understand electrical energy use at home and the workplace
- identify ways to reduce electrical energy use in homes and the workplace
- investigate how community and other events, organizations or businesses use electrical energy and what is being done to reduce energy consumption.

*Students will:*

- recognize that our **solar system** is similar to and different from the composition and movement of other objects in space (e.g., comets and constellations)
- identify patterns and make predictions about **motion in space**, (phases of the moon, Earth's seasons, planets, star systems and the movement of human-made satellites), and recognize that traditional Aboriginal cultures used patterns of motion in space for a variety of reasons such as measuring time
- recognize that Earth is affected by events/activities in space such as solar flares and the moon's effect on tides
- recognize that technologies contributing to **space travel** and **space exploration** affect our everyday lives (radio transmission, global positioning systems (GPS), space stations, fabrics, building materials, life-support technologies and telescopes)
- examine risks of space exploration and space travel
- investigate community and other events, organizations or businesses that relate to or are involved in space exploration and space travel.

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